

TECHNICAL NEWS BULLETIN

OF THE BUREAU OF STANDARDS

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COOPERATIVE WORK WITH FOREIGN LABORATORIES IN METHODS OF DETERMINING GASES IN METALS

For several years the bureau has been interested in the development of methods for determining gases in metals, particularly in iron and steel. Recent work along this line has been the development of vacuum fusion methods of analysis and the comparison of these with earlier methods.

While the rôle which may be played by the amounts of gases normally present in commercial irons and steels is not yet clearly defined, nevertheless it is the quite general belief of interested chemists and metallurgists that the gas content of iron and steel deserves some very careful study. The metallurgical laboratories of a number of American manufacturers have lately undertaken analyses for gases in metals. Similar

methods of analysis are employed to some extent in England, Germany, and Sweden.

In order that the data on the gas content of metals, which presumably will be gathered by these various widely separated laboratories, might have some basis of intercomparison, it seemed very desirable that analyses should be made on samples of the same irons and steels by a number of these laboratories. This was all the more necessary because some of the methods of analysis in general use are comparatively new, and their limitations may not as yet be fully recognized. The bureau distributed samples of an ingot iron for gas analyses to Prof. C. H. Desch, of the University of Sheffield, Sheffield, England, to the late Prof. P. Oberhoffer, of the Institut für Eisenhüttenkunde, Aachen, Germany, and to a cooperating laboratory in Sweden.

The results from the English and German laboratories have just been reported. The analyses at Aachen were carried out by Doctor Messenbruch after the death of Professor Oberhoffer. No results are as yet available from the Swedish laboratory.

The composition of the ingot iron distributed was as follows:

	Per cent
Carbon.....	0.04
Manganese.....	.03
Sulphur.....	.02
Silicon.....	.006

The analyses at Sheffield were made by the hydrogen-reduction method using a solid sample with the addition of an antimony-tin alloy. The analyses at Aachen were made by a vacuum-fusion method, heating by high frequency induction in a graphite crucible essentially as in the Bureau of Standards method described in Scientific Paper No. 514. The German method, however, differs from the bureau's method in that the evolved gases are collected and determined volumetrically. The analyses at this bureau were carried out by the vacuum-fusion method as regularly employed, and as described in the above-mentioned scientific paper. The results obtained by the cooperating laboratories are as follows:

Laboratory				
University of Sheffield	Institut für Eisenhüttenkunde		Bureau of Standards	
Type of analytical method				
Hydrogen reduction (with anti-antimony-tin addition)	Vacuum fusion (volumetric)		Vacuum fusion (gravimetric)	
	Oxygen	Oxygen	Oxygen	Hydrogen
	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>
	0.056	0.055	0.0008	0.057
	.057	.059	.0008	.059
.049	.062	.0007	.058	
.048			.058	.0008
.049				
.051				
Av. .051	.059	.0008	.058	.0006

For this particular class of material, an ingot iron, the two modifications of the vacuum fusion method give practically the same values for oxygen. The hydrogen-antimony-tin reduction method, using a solid sample, gave a value for oxygen but slightly lower. The average value for hydrogen was slightly higher by the volumetric vacuum fusion method than by the gravimetric vacuum fusion method.

Similar cooperative analyses of steels and cast irons seem desirable, and steps have already been taken to initiate further cooperative work.

PREPARATION AND ELECTRICAL PROPERTIES OF RUBBER HYDRO-CARBON

In continuation of an investigation on the electrical properties of rubber¹ a new method is being developed for the production of rubber hydrocarbon.

Crude, or natural gum rubber contains about 93 or 94 per cent of the hydrocarbon to which it owes its characteristic properties; the remainder of the composition is made up of proteins and resins, each to the extent of 3 or 4 per cent, while inorganic salts and other constituents amount to a fraction of 1 per cent. Essentially the method of obtaining the hydrocarbon consists in the removal of the nonhydrocarbon constituents from raw rubber in such a way as to leave the hydrocarbon itself in its original state, as nearly as this may be possible.

Removal of the protein is accomplished by digesting crude rubber with water, or with a water-alcohol mixture, at an elevated temperature. In some experiments the digestion was carried out for 10 hours at 185° C. Subsequent extraction with acetone removes the resins and also any residual protein hydrolysis products. A portion, though not all, of the salts are removed by the treatments with water and acetone.

¹ Density and Electrical Properties of Rubber-Sulphur Compounds; H. L. Curtis, A. T. McPherson, and A. H. Scott. Scientific Papers of the Bureau of Standards, No. 560; 1927.

After the acetone extraction, the product is dried to constant weight.

In appearance and consistency rubber hydrocarbon prepared by this process does not differ greatly from well-milled crude rubber. There is no indication of any marked change in the nature of the hydrocarbon from its state in the original crude rubber.

Complete analysis of the rubber hydrocarbon has not yet been made. The fact that the material is colored is evidence of the presence of impurities, though perhaps in small amount. The nitrogen content of one lot of hydrocarbon was 0.02 per cent, the portion insoluble in benzene was 0.17 per cent, and the ash, 0.08 per cent. The purity of the hydrocarbon is probably of the order of 99½ per cent. For present purposes, high purity is considered less essential than the preservation of the original molecular state of aggregation of the hydrocarbon.

Rubber hydrocarbon undergoes vulcanization on heating with sulphur. Electrical test specimens have been made of compounds of rubber hydrocarbon with sulphur covering the entire range of composition from the hydrocarbon alone to hard rubber. Measurements of dielectric constant, power factor, and resistivity on two lots of hydrocarbon, one derived from pale crêpe and the other from up-river Para rubber, gave practically identical results.

The electrical properties of rubber hydrocarbon and its compounds with sulphur differ quite materially from the properties of raw rubber and its sulphur compounds. Specific data on the electrical properties are not available for publication at this time.

NEW EQUIPMENT IN LENGTH SECTION

The installation of equipment in the new underground comparator and dividing engine room of the length measurement section has been completed. Active testing work in the new laboratory was started late in November. The calibration of a 1-meter bar submitted several months ago has been nearly completed, and observations made for a calibration

of the bureau's laboratory meters. Definite arrangements have been completed for a program of line standard calibration which is very necessary. The work will be started at once. Another line of work involving circle graduation and calibration will also be commenced.

DIGEST OF WEIGHTS AND MEASURES DECISIONS

The collecting and digesting of the weights and measures cases which have been decided by the courts of record in the United States is a project which has been contemplated by the bureau for some years. The compilation of the weights and measures statute laws was published a short time ago, and an opportunity is now presented for doing some work on the cases. A start was made during the past month, and the syllabi of about 60 cases have been copied.

A systematic search will be made of the court records, utilizing to the fullest extent the various reference works and agencies available. It is the intention to obtain complete references to all weights and measures cases from the commencement of our courts to the present time.

The information which can be gathered from these records will place the bureau in an advantageous position to render increased service to the State and local weights and measures officials. This information should be of value in assisting these officials to interpret the laws and to avoid bringing before the courts cases which can not be prosecuted successfully. The information should also be of value in the drafting of legislation, so that it will be reasonably certain to be constitutional, of definite meaning, and of the desired scope and effectiveness.

FUNDAMENTAL STUDY OF GLAZE FIT

An investigation is being conducted at the Columbus branch of the bureau to determine the effect of the various oxides on the tensile strength, modulus of elasticity, and coefficient of expansion of glazes. Factors applicable to the

various oxides have been worked out for the modulus of elasticity and tensile strength of the glazes based on the batch compositions.

The Fizeau-Pulfrich method, which has been in use for a number of years at the bureau for the measurement of small dilatations, was used in determining the coefficient of linear expansion of the glazes. The extreme sensitiveness of the interferometer makes it possible to work with a small specimen of the material. The rods used in this work varied from 0.3 to 0.8 mm. in thickness. The small size of this apparatus simplifies the problems of uniform heating and temperature control. The heating rate used in this work was 3° C. per minute.

The coefficient of expansion has been determined on about 75 per cent of the glazes (95 have been melted and fired). It has been found necessary to heat the glazes to a critical temperature before determining the expansion behavior. This is necessary before a reproducible expansion curve can be obtained for the glazes. All of the rods were annealed before the physical properties were determined. The annealing temperature for the experimental glazes was found to vary from 315° to 725° C. depending upon the composition.

The temperature expansion curves obtained for the glazes are not strictly linear, as the slope increases slightly with the temperature. The mean coefficient of linear expansion has been calculated and is found to vary from 0.0456×10^{-4} to 0.1581×10^{-4} . The former value is for a high magnesium glass while the latter is for a high soda-potash glass.

The values for the oxides seem to be arranged in about the following order: Na_2O , K_2O , BaO , PbO , B_2O_3 , ZnO , CaO , Fe_2O_3 , Al_2O_3 , MgO , SiO_2 . This arrangement is only tentative and will probably be found to vary in the different types of glazes. Thus the value for B_2O_3 passes through a minimum at about 20 per cent in lead glazes.

The chemical analysis of the glazes is about 40 per cent completed at present.

It was found necessary to analyze the material rather than use the batch composition because of volatilization of constituents and reaction with the pots.

EFFECT OF WETTING ON THE ADHESION OF GYPSUM PLASTER TO GYPSUM PLASTER BOARD

Previous work at the bureau demonstrated the fact that the bond between gypsum plaster board and properly applied sanded-gypsum plaster is sufficiently great to allow of plaster board being used as backing for plaster in ordinary construction work.¹ In case of fire, leaky roofs, or faulty construction plaster backings are often exposed to accidental wetting. As much confusion exists relative to the effect of such accidental wetting upon the bond between gypsum plaster board backing and gypsum plaster, the bureau undertook a series of tests to determine the extent of this effect.

Panels 9 inches square of 2:1 sanded-gypsum plaster were applied to single-ply gypsum plaster board, the plaster board being a commercial product obtained on the open market. Before application of the plaster the board was securely fastened to a solid wood frame by nailing, the nails being spaced 3 inches apart. Embedded in the plaster of each panel was a perforated steel plate, supplied with a mechanism for attaching the whole in a testing machine so that the plaster could be readily pulled free from the backing.

After drying, the various panels were wetted by soaking under water for five minutes. Two samples were tested immediately for adhesion, the remainder being stored in the laboratory to dry for periods of time ranging from one to four weeks before being tested. The following table gives the adhesion, in pounds per square inch, required to produce rupture between 2:1 sanded-gypsum plaster and a backing of single-ply gypsum plaster board under the conditions noted. All figures are the average of two or more tests.

¹ Adhesion of gypsum plaster to various backings, by J. P. C. Peter, the American Architect, September 9, 1925.

Time of drying after wetting (weeks)	Adhesion
	<i>Lbs./in.²</i>
0.....	2.99
1.....	4.28
2.....	6.04
4.....	7.50
Unwetted.....	6.0

It will be seen that the strength of the bond between the plaster and the plaster board increases as the time allowed for drying is increased. Those panels given as unwetted were tested one week after application of the plaster, therefore, it is probable that they were not completely dry at the time of testing. It is interesting to note that the adhesive values of panels which were wetted, then dried for periods of two or four weeks are greater than the adhesion of the unwetted panels. It was also noted that those panels tested for adhesion immediately after wetting failed in tension in the fibers of the plaster board itself rather than at the juncture of board and the plaster. This indicates that it is the strength of the board rather than the strength of the plaster bond which determines the breaking point at this age.

These tests indicate that while wetting weakens the bond between gypsum plaster and gypsum plaster board, the full adhesive strength is regained as the materials again become dry.

PRECAST STONE INVESTIGATION

Tests have been started at the bureau to determine the physical properties of precast stone with the object of preparing Federal specifications for this material. Samples were obtained from various manufacturers scattered throughout the United States giving 17 different varieties or types of stone. The preliminary tests decided upon were: Compressive strength of wet and dry specimens, modulus of rupture, modulus of elasticity, rate of absorption, porosity, and ability to resist weathering.

The following are the methods used and the results obtained:

1. Because of the various shapes into which precast stone may be molded, the advisability as to the size of the specimens was taken into consideration and a comparison was made of the compressive strengths of cylinders 2 inches in diameter, 4 inches long; cylinders 2 inches in diameter, 2 inches long; and cylinders 1 inch in diameter, 2 inches long. It was found that the compressive strength as shown by the cylinders 2 inches in diameter, 4 inches long ranged from 3,200 to 8,200 lbs./in.²; that the 2 by 2 inch cylinders gave a strength varying from 5,640 to 9,400 lbs./in.²; while the 1 by 2 inch cylinders were approximately 8 per cent lower in strength than the 2 by 4 inch cylinders.

2. Modulus of rupture as determined by tests on 1 by 1 by 8 inch prisms gave results that vary from 900 to 1,500 lbs./in.³

3. The modulus of elasticity as determined by means of the Tuckerman strain gauge on the cylinder 2 inches in diameter 4 inches long gave values ranging from 1,400,000 to 3,300,000 lbs./in.²

4. To determine the per cent absorption of water the specimens were dried at 110° C. until their weight became constant, this usually requiring about 72 hours. The specimens were then immersed in water and taken out at intervals, the surplus water removed with a towel, and weighed. The increase in weight expressed as percentage of the dry weight was recorded as the absorption. The per cent absorbed at the end of 48 hours varied from 4.54 to 7.78. Upon boiling the specimens three hours an increase of from 5 to 150 per cent over 48-hour cold-water absorption was noted.

5. The porosity was determined, assuming that all the pores were filled after three hours boiling, by using the following formula:

$$\text{Per cent porosity} = \frac{\text{Weight (after 3 hours boiling)} - \text{weight dry}}{\text{Weight (after 3 hours boiling)} - \text{weight suspended in water}} \times 100$$

6. Freezing and thawing weathering tests are now in progress. Eighteen cycles have been completed to date without any noticeable disintegration.

CRACKING OF PAINT FILMS

The paint section of the bureau has constructed apparatus for determining when a paint, varnish, or bituminous coating on a metal panel has failed by cracking. Such failures can not ordinarily be seen with the naked eye unless the cracks are very bad.

The operation of the apparatus is as follows: (1) A metal panel is coated on one side with the paint. (2) A set of head phones is connected in series with the back of the panel. (3) The painted surface is stamped with a number of drops (50 in all) of a conducting solution prepared so as to wet the surface. (4) A voltage from an interrupted source is placed across the head phones and panel, and the circuit completed by touching the return wire to the drops. If there is a break in the paint film a loud buzz will be heard in the head phones.

So far the results obtained by this method check with observations made on the paint.

INCREASING THE DURABILITY OF UNITED STATES PAPER CURRENCY

The investigation which the Bureau of Standards has been conducting in cooperation with the Bureau of Efficiency and the Bureau of Engraving and Printing with the object of increasing the life of United States paper currency was briefly described in Technical News Bulletin No. 109, May, 1926. This work is being actively continued.

One of the most important facts discovered during the past year was that the strength imparted to currency paper by glue sizing is practically all destroyed in the processes used to print the paper. On the other hand, it was found that the basic strength of the paper—that is, the strength produced by the paper fibers—is not impaired by the printing. This has

led the Treasury Department to adopt the type of paper developed by the Bureau of Standards as the standard currency paper, because the distinctive feature of this paper is its high fiber strength. Another desirable characteristic of the paper is its lack of grain. It has a folding strength in the two principal directions of over 5,000 double folds. A study of commercial papers showed that the Bureau of Standards' paper had no counterpart commercially. In view of this situation, fine-paper manufacturers in general were asked to cooperate in commercial development of the new type of paper. Several concerns conducted paper-making experiments in their mills, following the bureau's paper-making procedure. Commercial papers were produced equal in strength and printing quality to those produced in a semicommercial way in the Bureau of Standards' mill. This showed that the paper-making procedure developed by the bureau is entirely feasible commercially, and, therefore, that the Treasury Department will not experience difficulty in obtaining the desired type of paper.

Additional problems in the paper manufacturing processes are being studied in the bureau's mill. Results so far obtained in investigation of the relative merits of cotton and linen fibers indicate that a part of the expensive linen fibers can be replaced by the cheaper cotton fibers without material injury to the quality of the paper. Also it is believed that caustic soda is preferable to lime in cooking the paper-making rags, in respect to both strength of the paper and its printing quality. Additional glue surface-sizing data obtained indicate that formaldehyde is preferable in many respects as a preservative for the paper glue-sizing solution, to the more commonly used alum.

It is estimated that these investigations have resulted so far in increasing the life of the paper currency over 40 per cent. It is believed that this figure will be further increased as additional improvements are put into effect.

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PROGRESS IN ADOPTION OF CERTIFICATION PLAN

Lists of "willing-to-certify" manufacturers have been compiled for 75 United States Government master specifications. About 570 copies of sets of these lists have been distributed in mimeographed form, almost exclusively in response to specific requests from purchasing agencies, a total of more than 43,000 lists having been distributed up to November 25, 1927. The average number of "willing-to-certify" manufacturers on each list is about 21, the aggregate number of names of manufacturers on the 75 lists being 1,609. There are 684 separate, individual manufacturing firms represented on these lists, the manufacturers averaging 2.35 specified commodities each. Work is now going forward actively on the compilation of 76 additional lists of "willing-to-certify" manufacturers, making a total of 151 United States Government master specifications to which the certification plan has been, or is being, applied. The additional specifications cover paper (30 specifications), soap (13 specifications), brushes and brooms (28 specifications), and miscellaneous pipe and plumbing supplies (5 specifications). Of these, 41 will probably be completed early in January, 1928, thereby bringing the lists in mimeographed form for distribution up to 116.

LABELING OF "CROSS-THE-COUNTER" COMMODITIES

Largely through correspondence, the bureau is bringing to the attention of interested organizations the benefits to be derived by all concerned from carrying to completion the bureau's full program, in accordance with which "nationally recognized specifications" for any chosen commodity are so formulated as to cover the most satisfactory commodity in the best possible manner, the manufacturers place this commodity in "mass production" in accordance with this specification, the suppliers issue their certificates guaranteeing compliance with this specification, and "guarantee labeling" establishments base

their tests and inspections on this identical specification.

A recent compilation shows that there are 68 nationally recognized trade associations, technical societies, and similar organizations that are now engaged in, or have definitely planned for, activities tending to bring about a change from the prevalent hit-or-miss methods of specifying manufacturing, and testing to a logical method of formulating specifications, manufacturing in conformity therewith, and testing to insure or guarantee compliance.

SIMPLIFICATION OF TIRE AND RIM SIZES

The National Tire Dealers' Association held their eighth annual convention at Louisville, November 14, 15, 16, and 17. The subject of standardization and simplification of tires and rim sizes was one of the important subjects discussed by the convention.

In this connection it is interesting to note that the tire executive committee of the Rubber Association of America have initiated the plan to change the markings on balloon tires so as to eliminate the 4.95 and the 5.77 cross sections. The elimination of the 4.95, which has been replaced by the 5.00 and the 5.77 which has been replaced by the 6.00, is explained as being in line with the desire of the original equipment committee of the rubber association to have balloon tires in the future confined to six cross sections, 4.40, 4.75, 5.00, 5.50, 6.00, and 6.75. Under the arrangements made the 30 x 5.77 is now marked 32 x 6.00, the 32 x 5.77 is now the 34 x 6.00, and the 33 x 5.77 is the 35 x 6.00.

S. B. Harper, vice president of the National Tire Dealers' Association, in a recent article in *Tires*, says:

The multiplicity of sizes of balloon tires and tubes has caused the tire dealers of the United States to materially increase their stock, which has resulted in an increase of investment this year. With the prevailing thought in business during the year to reduce costs to a minimum and to increase turnover, this unwarranted increase in tire and tube sizes has added another burden to the already overburdened tire dealer and distributor. There are 37 or more sizes of

tires being made at present, with 10 cross sections and 5 different wheel sizes. Despite this large selection, practically 80 per cent of the tire sales during the early months of the year were confined to 5 of these 37 sizes.

STANDARD HEIGHT FOR AUTOMOBILE BUMPERS

Of greatest popular interest is the proposed standardization of passenger car, small motor coach, and light delivery car bumpers at a height of 18 inches above the ground at the front and 19 inches above the ground at the rear, so that bumpers will not interlock but the faces of the bumpers on two vehicles will meet when they come together. The over-all length of both front and rear bumpers on passenger cars is specified as 60 inches, and the vertical depth of the faces is specified at 2 inches, according to the American Machinist.

SIMPLIFIED INVOICE FORM

The simplified invoice form recommended by the Bureau of Standards has been adopted by numerous associations, including the American Institute of Accountants; American Manufacturers Association; American Railway Association, division 6, purchases and stores; American Society of Agricultural Engineers; American Supply and Machinery Manufacturers Association; Autographic Register Manufacturers Association; Continuous Fold Printers Association; Controllers Congress; Direct Mail Advertising Association; National Association of Builders Exchanges; National Association of Certified Public Accountants; National Association of Purchasing Agents; National Electrical Manufacturers Association; Railway Accounting Officers Association; Sales Book Manufacturers Association; Society of Industry Engineers; and United Roofing Contractors Association.

In addition, more than 300 individuals have also promised to adopt the form.

SIMPLIFIED PRACTICE REVISION CONFERENCES

Recent conferences considered the following materials:

Files and rasps.—This recommendation was reaffirmed for the third term by the industry. This action, which covers

a period of one year, became effective November 1, 1927. The original recommendation reduced the stock varieties from 1,351 to 496, an elimination of 65 per cent. The revision conference reported that, following a survey of the industry, it was found that the average adherence to the recommendation was 93 per cent.

Sheet steel.—This recommendation was reaffirmed by the industry for the fourth year, effective January 1, 1928. The revision conference reported that the average adherence to the sheet-steel portion of the recommendation was 85 per cent. The original recommendation for sheet steel simplified the varieties from 1,819 to 263, a reduction of 85 per cent.

Eaves trough and conductor pipe.—This recommendation was reaffirmed by the industry for the third year, becoming effective January 1, 1928, for a period of one year. The industry reports an average adherence to this recommendation of 92 per cent. The original recommendation simplified the varieties from 21 to 16, a reduction of 24 per cent.

Tinware, galvanized and japanned ware.—This recommendation was reaffirmed for a period of one year, effective January 1, 1928. The report stated that the average adherence for this recommendation was 92 per cent. The original recommendation simplified the varieties from 1,154 to 873, a reduction of 24 per cent.

Terneplate.—This conference changed the title of its recommendation to Roofing Ternes, in order to eliminate any confusion which might arise from the fact that terneplate sheets are used for many purposes in addition to roofing, and the consumption of roofing terneplate is small compared to the total volume which goes into other manufactured products. This recommendation was reaffirmed for a period of one year, from January 1, 1928. The original recommendation simplified the weights from 9 to 7, a reduction of 22 per cent.

Bank checks and notes.—Simplified Practice Recommendation No. 50, Bank Checks, Notes, Drafts, and Similar Instruments, has been reaffirmed without

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change, for another year, effective January 1, 1928.

At this revision conference the use of window envelopes was discussed, and the products of commercial manufacturers and the United States Post Office Department were taken up with a view to recommending one size suitable for transmitting standard commercial instruments. Such documents would include not only bank checks, drafts, and notes, but inquiry, purchase order, and simplified invoice forms. The committee believes that all requirements will be met by envelope $3\frac{5}{8}$ by $8\frac{5}{8}$ inches with a $1\frac{1}{4}$ by $\frac{1}{2}$ inch window, located $\frac{3}{4}$ inch from the left-hand end and $\frac{7}{8}$ inch from the bottom of the envelope. Final action on this recommendation was postponed by the conference, pending further consultation with governmental and nongovernmental producers.

The conference was of the opinion that gratifying progress has been made toward the general adoption of, and adherence to, the standard check forms, and that continued effort on the part of all concerned will eventually bring about the complete elimination of nonstandard sizes and arrangement of face.

Tissue paper.—A second reaffirmation, through a meeting of standing committee in Chicago on October 24, of Simplified Practice Recommendation No. 46, places this recommendation in effect for its full period of operation. A survey conducted by the industry indicated an approximate adherence of 85 per cent on the part of the manufacturers, and 93 per cent on the part of the jobbers. This established a very marked increase, as last year's survey showed an average adherence of about 51 per cent.

NEW PUBLICATIONS

Additions to Supplementary List of Publications of the Bureau of Standards (beginning July 1, 1927)

Technologic Papers¹

T351. Practical applications of the earth-current meter; Burton McCollum and K. H. Logan. Price, 20 cents.

T352. Use and testing of sphygmomanometers; J. L. Wilson, W. N. Eaton, and H. B. Henrickson. Price, 20 cents.

Circulars¹

United States Government Master Specifications for:

C261 (2d ed.). Colored cotton rags (sterilized) for wiping machinery. Price, 5 cents.

C264 (2d ed.). White cotton rags (sterilized) for wiping machinery. Price, 5 cents.

C351. Cotton tablecloths. Price, 5 cents.

C352. Jute burlap. Price, 5 cents.

C353. Axminster carpets and rugs. Price, 5 cents.

C354. Plain velvet carpets. Price, 5 cents.

C355. Wool bunting. Price, 5 cents.

C356. Wilton carpets and rugs. Price, 5 cents.

C357. White table oilcloth. Price, 5 cents.

Simplified Practice Recommendation¹
(Elimination of Waste)

R1 (5th and 6th rev.). Paving bricks. Price, 5 cents.

R10 (1st rev.). Milk and cream bottles and bottle caps. Price, 5 cents.

R45 (1st rev.). Grinding wheels. Price, 10 cents.

Miscellaneous Publications¹

M81. Annual report of director of the Bureau of Standards for fiscal year ended June 30, 1927. Price, 10 cents.

Technical News Bulletin¹

TNB128. Technical News Bulletin, December, 1927.

OUTSIDE PUBLICATIONS²

Long wave radio measurements at the Bureau of Standards in 1926 with some comparisons of solar activity and radio phenomena. L. W. Austin; Proceedings, Institute of Radio Engineers (New York, N. Y.), Vol. 15, No. 10, p. 825; October, 1927.

Radio atmospheric disturbances and solar activity. L. W. Austin; Proceedings, Institute of Radio Engineers

¹ Send orders for publications under this heading, with remittance, only to Superintendent of Documents, Government Printing Office, Washington, D. C. Subscription to Technical News Bulletin, 25 cents per year (United States, Canada, and Mexico); 40 cents (foreign).

² "Outside publications" are not for distribution or sale by the Government. Requests should be sent direct to publishers.

- (New York, N. Y.), Vol. 15, No. 10, p. 837; October, 1927.
- Measurement and application of certain physical properties of dental amalgam. Wilmer Souder; *Journal of Dental Research* (New York, N. Y.), Vol. VII, No. 2, p. 173; June, 1927.
- The effect of running in on journal bearing performance. S. A. McKee; *Mechanical Engineering* (New York, N. Y.), Vol. 49, No. 12, p. 1335; December, 1927.
- Continuation of 1922 report on brake linings. S. Von Ammon; *Journal, Society of Automotive Engineers* (New York, N. Y.), Vol. XXI, No. 5, p. 551; November, 1927.
- The seasonal variation in the fire loss. Ruth L. Morgan; *Safety Engineering* (New York, N. Y.), Vol. LIV, No. 4, p. 131; October, 1927.
- Severity, duration, and control of exposure. S. H. Ingberg; Committee Report in Proceedings, National Fire Protection Association (Boston, Mass.), Vol. 31, p. 295; 1927.
- Standard fire tests. S. H. Ingberg; Discussion in Proceedings, Building Officials' Conference (Springfield, Mass.), Vol. 13, p. 85; 1927.
- Fire resistance of brick walls. S. H. Ingberg; *Engineering News Record* (New York, N. Y.), Vol. 99, No. 16, p. 628; October 20, 1927.
- Graphite for electrotyping. J. H. Winkler and W. Blum. Circular published by the International Association of Electrotypers (Cleveland, Ohio); October 1, 1927.
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- Research the best way to reduce costs. H. L. Whittemore; *Bulletin, American Petroleum Institute* (New York, N. Y.), Vol. VIII, No. 57, p. 107; October 1, 1927.
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